

Abstract of the Disclosure

A porous SOG film is formed by preparing an organic silane solution containing an organic silane, water and an alcohol, subjecting the organic silane to acid hydrolysis or alkali hydrolysis and then heat-treating the resulting reaction system in the presence of a surfactant to thus form a porous SiO₂ film to use for an interlayer insulating film. Alternatively, a porous SOG film is formed by repeating the foregoing step at least one time; or by forming a hydrophobic film on the porous SiO₂ film prepared by the foregoing step by the CVD or sputtering technique to thus cap the surface of the porous film; or repeating the porous film-forming and capping steps at least one time. Moreover, after the preparation of the foregoing porous SiO₂ film, it is subjected to either of the oxygen plasma-treatment, electron beam-irradiation treatment and UV light-irradiation treatment to remove the unreacted OH groups remaining on the porous film and to thus form a porous SOG film. Further, the foregoing heat-treatment is carried out in the following two stages: in the first stage, the porous film is treated at a temperature capable of mainly removing the water and the alcohol through evaporation thereof; and in the second stage, the porous SiO₂ film is treated at a temperature (350 to 450 °C) sufficient for covering at least the inner walls of the holes with the hydrophobic moieties of the surfactant.